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ABSTRACT

Staff of the Tennessee State University Class Size Project investigated effects of a 1:15 teacher/pupil ratio on first grade students' reading and mathematics achievement, behavior, attendance, and self concept. Participants were first grade pupils attending metropolitan Nashville public schools, who were assigned to an experimental group of seven classes at a school serving more than 50 percent economically disadvantaged students. A primary control group consisted of first grade students from a comparable neighboring school in 1:25 ratio classes, a blind control group was drawn from 35 elementary schools and was matched with the experimental group demographically, and a comparison group consisted of the district's first grade population as a whole. Curriculum studied by all students was from the Metro-Nashville elementary curriculum. Instructional methods were determined by each individual teacher. No instructional interventions were provided during the study and no extra support, supplies, materials, etc. were provided to any group. Initial-year findings favor the 1:15 classes in pupil achievement, behavior, teacher perceptions, and in teacher comments regarding instruction and classroom activity. The 1:15 condition seemed to benefit "free lunch" and "not free lunch" pupils approximately the same, rather than reproducing the usual result, whereby higher SES youth outperform their lower SES peers. (RH)

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Small Class Size Once Again: An Experiment in Grade One, Metro-Nashville Public Schools.

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Introduction and Background

Class size has been debated for years. It seems logical that reduced class size should have positive benefits both for pupils and teachers. Yet researchers have failed to provide definitive results on class size and achievement. The jury is still out. Recent events show that there may be renewed interest in studying reduced teacher-pupil ratios and pupil achievement. One classic debate focused on a meta-analysis of class size studies (Glass et.al., 1979; Education Research Service, 1978, 1980). Some research suggests that small (1:15) classes in the early grades improve students' chances to get a sound educational foundation. This, in turn, greatly increases their chances of completing high school without failures. Balow (1969) found that a class-size reduction from an average of 1:30 to 1:15 seemed to lead to achievement gains in reading for pupils in grades one to four. Perhaps here is one of the problems. Early class size studies debated different class sizes from those of concern today; they often studied reductions from 36 to 25 pupils, or so. The real payoff, it now seems, is with a significant class size reduction--one teacher with up to 15 pupils.

A major hurdle for definitive research of small class size is a lack of funding. A classroom with one teacher and 15 pupils (1:15) is more expensive than 1:25 or so. Many policy groups, grappling with rampant costs, reject out-of-hand a significant reduction in class size as too costly for public schools. This perception of cost fails to consider potential savings if, as a result of small classes, students did not have to repeat grades later on. Or savings that could accrue if there were fewer dropouts, less truancy, fewer

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discipline problems, and reduced future welfare payments. In Tennessee in 1983-84 an incarcerated youth at the Spencer Youth Center cost the state $21,170 per prisoner. In 1985, Tennessee spent $15,027 per year for each prisoner in adult prisons. In addition, 54,000 youngsters were retained in grade throughout the state in 1984. At the state's ratio of 1:25, this retention meant 2160 teachers (with all other school-related costs). The state's welfare program alone cost $429 million for 581,000 persons. A comparison of these correction, education, and welfare costs with the expense of increasing the expenditure from $1,874 per pupil in K-3 classes of 1:25 to $2,624 per pupil in classes of 1:15 helps put the issue in perspective. (Estimates using 1984 data). Individual attention possible in 1:15 classes could help in attaining such altruistic goals as better citizenship and a better skilled labor force.

A renewed interest in small classes for pupils in the primary grades is beginning slowly to spread. In 1981 Indiana began Prime Time, a two-year experiment with 24 K-2 classes of 1:14 in nine schools. After two semesters, 61 percent of the students exceeded normal achievement in reading, and 53 percent exceeded it in math. Students not in the smaller classes had comparable figures of 47 percent in reading and 49 percent in math. Of equal importance were changes in classroom management and instruction. Based on a combination of observations and interviews the following results were noted: fewer discipline problems; improved teacher morale; better communication between teachers and parents; greater ability to cover more curriculum content in greater depth and at an increased pace; more immediate and improved feedback on student work; more participatory learning experiences; increased observation and supervision by teachers; greater use of enrichment activities; increased use of learning centers to provide extra practice for students who need it. Based on the results of this study, the Indiana legislature endorsed

a program to reduce class size in K-3 to a 1:18 ratio. It began with first grade in 1984-85 and will include second, third, and kindergarten in succeeding years.

In July 1984, Tennessee State University's (TSU) Center for Excellence in the Teaching of Basic Skills to Economically and Educationally Disadvantaged Students was funded as a part of Governor Alexander's Better Schools Program for Tennessee. In September 1984, the TSU's Class Size Project started in the Metro-Nashville School System; the project will continue until June 1987. In its first full year the project conducted activity in the first grades of two similar schools. This paper presents some background of the study, some preliminary results, and some developments in the renewed interest in class-size research.

Staff of the TSU Class Size Project are studying the effects of a class size of 1:15 in grades 1-3. Student variables include (1) reading achievement, (2) math achievement, (3) behavior, (4) attendance, and (5) self-concept. Other purposes are to identify changes affecting the teaching-learning process and to review teachers' perceptions of classroom conditions. Although not a primary purpose, staff will try to determine if reduced class size seems to affect different groups differently (pupil achievement by race, sex, SES, etc.).

Metropolitan Nashville Public School System pupils in grades 1-3 during the project constitute the population for the study. The sample for the first year were grade-one pupils in two schools serving similar neighborhoods. One school contained the experimental classes and the second school served as a control. Schools had to have space for the additional classes and appropriate agreements to participate in the study, including parental consent.

The <u>experimental group</u> (X) consisted of seven classes (1:15, n=105) of first-grade students. The school contained more than 50 percent economically

disadvantaged pupils. The immediate school community consisted of predominately single-family residences and trailer parks. The acceptable court-established racial mix of a ratio of 80 percent white and 20 percent black pupils was achieved by busing from inner-city housing projects.

The study really had two control groups and one comparison group. The primary control group was a nearby school. A second control group, designated the "blind control group," was drawn from the rest of the approximately 5,000 Metro-Nashville grade-one pupils after removal of the experimental and control groups. Comparable results (e.g., city-wide testing) of all Metro-Nashville grade-one pupils served also as a point of comparison.

The control group (O) was drawn from a comparable neighboring school with kindergarten through sixth grade. The first-grade enrollement consisted of 90 first grade students divided among three and one-half teachers with a class size of 25 students each. This represented normal class size.

The blind control group (O_b) of first-grade students was drawn from 35 elementary schools and was matched with the X group demographically according to the following five criteria: (a) sex, (b) race, (c) economic status (federally subsidized lunch), (d) birthdate within 45 days, and (e) California Achievement Test, Level 10 (CAT 10) total prereading raw score within four points.

The X and O groups in this study were identified as being comparable within the Metropolitan Nashville School System according to the following characteristics: (a) middle to lower-middle class community as evinced by economically disadvantaged qualifications, (b) racial mix acceptable to the system's court-established ratio of 80 percent white and 20 percent black, and (c) generally comparable student achievement over time. For example, in 1983-84, the two schools and the Metro-Nashville system had the following average

raw scores for pupils in grade two. The control and systemwide scores exceeded the X school's scores only slightly on both reading and math.

	Experimental		Control		System-wide	
	Math	Read.	Math	Read.	Math	Read.
CAT 12 (grade 2)	47.8	47.3	54.0	53.0	50.7	51.5

After the project began, the X school was found to be below the O school on one variables considered important. The X school, with 57 percent of its students receiving federally subsidized lunches, had a greater degree of deprivation than the O school (39 percent) or the school system as a whole (45 percent). The X school enrolled 23 percent black students and the O school enrolled 26 percent black students.

Curriculum, Instruction and Teacher Factors

The curriculum for all students was the adopted Metro-Nashville elementary curriculum. The instructional methods were determined by each individual teacher. Teachers in the experimental school kept logs of their impressions and perceptions, and of instructional activities and teaching methods employed during the school year. No instructional interventions were provided during this study and no extra support, supplies, materials, etc. were provided to any group. The setting was kept as natural as possbile in order to isolate, as well as possible, the impact of reduced class size (1:15)

The first-grade teaching staff at the experimental school consisted of seven teachers with teaching experience ranging from 3.5 to 35 years. Their first-grade teaching experience ranged from 0 to 20 years. Three of the seven female teachers with an average age of 43.3 years were white; four were black. The teachers averaged 5.8 days of absence while with Metro Schools. Teacher academic preparation was: B.A. (3), M.A. (1), and M.A. plus 45 (3).

Academic Achievement and Other Results

The California Achievement Tests (CAT) 10 and 11 were used because the school system used the CAT system wide. The CAT allowed comparison of project math and reading scores with all Metro first grade students; more importantly, this choice allowed the use of a blind control group.

There were several ways to analyze student achievement data in the study. Researchers chose a combination of one-way analysis of variance (ANOVA) comparing the pretest scores (CAT 10) for the three groups (experimental or X, control or 0, and blind control or 0_b) and also an ANOVA on the posttest scores (CAT 11) for the same groups. An analysis of covariance (ANCOVA) using the pretest (CAT 10) as the covariate was used to analyze pre-to-post gains. Results of both analysis procedures are described briefly here. Table 1 shows, for the three groups ($X,0,0_b$), results of the ANOVA for pretests (CAT 10) and posttests (CAT 11), and the ANCOVA.

The pretest ANOVA (Reading) showed that the X group was statistically different from 0 but not 0_b. The 0 and 0_b groups were different ($p \leq .05$, Sheffe test) on the pretest (CAT 10, Reading). The pretest ANOVA (Math) showed that the X group was not statistically (.05 Sheffe) different from the 0 and 0_b groups, but that the 0_b group was statistically greater than the 0 group. The posttest ANOVA (Reading) showed that the X group was different from both 0 and 0_b groups. The posttest ANOVA (Math) showed that the X group was different from the 0 group, but not the 0_b group. There were no significant differences between the two control groups (0, 0_b) on either reading or math. This finding encouraged the use of the ANCOVA.

The ANCOVA analyses showed that results (pre-to-post gains) were considerably different among groups ($P \leq .000$) for both Math and Reading. Inspection of mean scores shows that while results clearly favored the X group, both control groups (0, 0_b) were very similar and both were lower than

TABLE 1

ANOVA (PRE AND POST) AND ANCOVA (PRE TO POST) RESULTS FOR THREE GROUPS (X, O, O_b) FOR 1:15 STUDY ON READING AND MATH SCORES

	Reading Test Results								Math Test Results							
	ANOVA						ANCOVA		ANOVA						ANCOVA	
	CAT 10 (Pre)*			CAT 11 (Post)			Pre to Post		CAT 10 (Pre)			CAT 11 (Post)			Pre to Post	
Group	N	$\bar{x}$	Rk**	N	$\bar{x}$	Rk	N	$\bar{x}$	N	$\bar{x}$	Rk	N	$\bar{x}$	Rk	N	$\bar{x}$
1. (X)	80	102.90	1	72	46.9	1	72	46.9	79	18.0	2	72	46.9	1	71	47.1
2. (O)	66	93.24	3	82	38.5	3	65	39.2	65	17.4	3	81	42.3	3	64	42.3
3. (O_b)	80	102.86	2	66	38.9	2	66	38.9	80	19.5	1	66	44.0	2	66	44.0
Results																
F.		7.180			15.92			14.14		3.890			7.08			8.48
Sig.		.000			.000			.000		.022			.001			.000
Diff. at .05		3 vs. 2*** 1 vs. 2			1 vs. 2 1 vs. 3			N/A		3 vs. 2			1 vs. 2			N/A

*Groups X and O_b were matched on CAT 10 (Criterion was within four points). Note that reading CAT 10 had 120 items and CAT 11 and 60 items, providing lower mean scores on CAT 11. CAT 10 (math) had 26 and CAT 11 had 56 items.

**RK=Rank ***Sheffe Test for difference between pairs; refer to groups above.

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the X group. (There are fewer pupils for the ANCOVA analysis since only those with all four test results were used).

An additional, non-statistical indicator that results favored the X group is the ranking of mean scores at both pre and post. The X group, although not always highest at project start, was clearly the highest at the end. The posttest analyses favored the X group and the ANCOVA analyses indicated that the pre-post gains were statistically important.

Based both on the statistical procedure of ANCOVA and the process of ANOVA to analyze pretest and posttest results, the X group consistently achieved considerably better results than either O or O_b. Since the only treatment was class size reduction (excluding such factors as the halo effect) one inference is that reducing class size to 1:15 in grade one has a positive effect on pupil reading and math outcomes. These initial achievement gains were analyzed further to help explain project results (in a later section of this paper). Analyses of pupil cognitive gains, however, were not the only indicators of project success. There were additional positive outcomes.

Self-Concept

The Piers-Harris Children's Self-Concept Scale was selected to assess self-concept. Although originally designed for students in grades 3-12, the scale was adapted for use with younger children after discussion with knowledgeable persons. Adaptation included reducing the total number of items from 80 to 34, simplifying vocabulary, and administering the scale orally and individually to each student. Adaptation reliability was estimated by retesting one class three weeks after the first testing. [Test-Retest = .70 (Sig. $p \leq .003$); Cronbach alpha (pre) = .83; (post) = .79] Validity was checked by obtaining each teacher's perceptions of the high and low self-esteem exhibited by students in her class.

The pre and post self-concept testings indicated no significant difference between the X and O groups. Care was taken to insure that children were tested orally and on an indivudal basis by the same tester for each test. A special school-wide self-concept program already in place at the control school could have influenced the results, but this is only conjecture. Testing of self-concept at this age can be affected by the immaturity of the children. Additional testing for self-concept differences will continue.

Attendance

Student attendance patterns were tabulated and compared through a review of seven monthly attendance reports for the X, O and O_b groups, and for all first-grade students in the Metro Schools. The two control groups and the city-wide comparison group all had higher rates of attendance than the X group. The X school has had a lower proportion of days present than both the control and total system comparison groups from 1982-83 through 1984-85. The blind control group comparison was possible only for 1984-85. See Table 2. The 1:15 project did not change the extant pattern.

Behavior

Corporal punishment incidents were recorded on appropriate forms and filed with the principals. Records were compared for the X and O groups, and for all first grade students in the Metro Schools. With only one reported corporal punishment incident, the behavior record (.01) of the X group was superior to the records for O (.29), O_b (.13) and all first-grade students (.16). This measure, however, is too sparse for any serious comparisons.

Classroom Activities

Teachers at the X and O schools completed a 24-item Inventory of Classroom Conditions which sought their perceptions of: (1) classroom climate, (2) noninstructional duties and activities, (3) classroom management/student behavior, (4) preparing and implementing instruction, and

TABLE 2

ATTENDANCE, AS PROPORTION OF DAYS PRESENT, FOR X, O, O_b AND SYSTEM FOR THE 1:15 PROJECT

		Proportion of Days Present		
		Group		
Year	$\overline{X}$	O	O_b	System
1982-83	.943	.950	-	.947
1983-84	.939	.958	-	.948
1984-85*	.938	.952	.944	.945

*Based on seven-month data

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(5) teacher and student interaction/individualization. Classroom activities were recorded in diaries or logs throughout the 1984-85 school year by individual teachers in the X group. Log entries were reviewed and summarized in the same five categories of the Inventory responses.

The experimental group teachers scored higher on 22 of 24 Inventory items, and markedly higher on several items relating to instruction and attention to the individual student. These items reflected time to work with each student on individual math and reading interest and achievment, and opportunity to prescribe remedies for individual learning problems, to provide teacher-made materials, and to cover adequately all required material. Control-group teachers scored higher than experimental- group teachers on items 21 and 23. Figure 1 compares Inventory of Classroom Conditions results between X and O teachers. Figure 2 shows the items. (Whittington, pp. 99-100).

The teacher log entries indicated that reductions in class size can have a positive impact on both teaching processes and student behavior. Teachers believed that they were more productive, that children learned more at a faster rate, and that student behavior was better. The teachers agreed on the following points concerning the 1:15 situation compared to regular classes:

1. Classrooms were quieter with fewer student interruptions.
2. Students showed appreciation for each other and all wanted to participate.
3. Potential discipline problems were identifed and resolved quickly.
4. There were more learning activities with an increased amount of pupil participation.
5. There was more time to monitor students' on-task behavior during the instructional process; provide quicker and more thorough feedback to students; reteach concepts as needed; provide in-depth instruction.
6. Individualizing instruction significantly reduced the need for reteaching.
7. Individual student-student interaction helped students understand one another while increasing their desire to help each other.

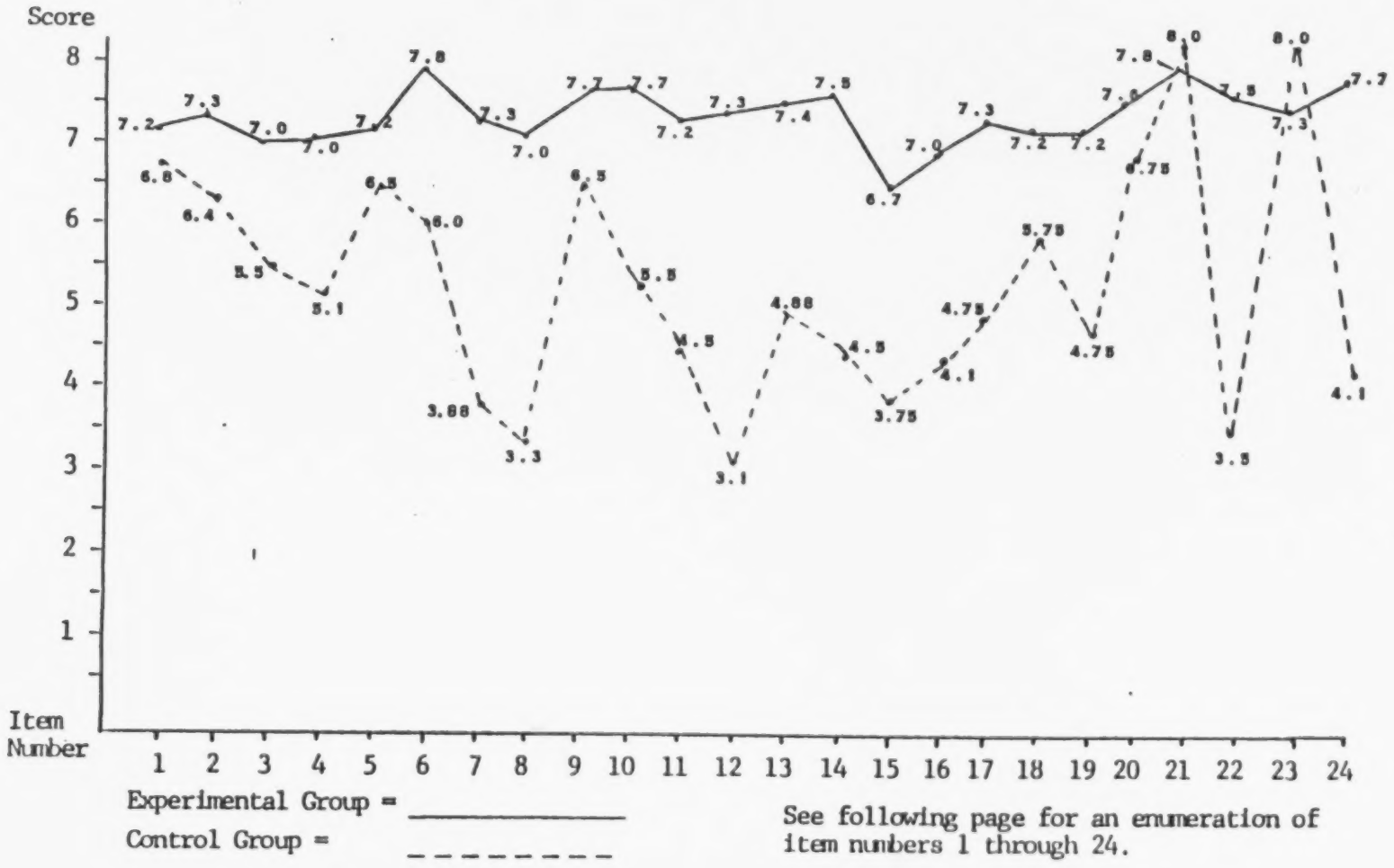
Score
8
7
6
5
4
3
2
1
Item Number
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Experimental Group = _____
Control Group = - - - - - - - -
See following page for an enumeration of item numbers 1 through 24.

Figure 1. Comparison of Average Scores of Teachers' Perceptions of Classroom Conditions between Experimental and Control Schools

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1. My classroom is free of tension.

2. There is opportunity to interact with each student more than once during a lesson.

3. I have the opportunity to become familiar with home background, health history, and academic history of all my students.

4. There is sufficient time to diagnose individual student problems.

6. Routine tasks, e.g., calling roll, collecting money, require little time.

7. There is opportunity to work with each student on his/her individual reading interest and achievement.

8. There is time to provide teacher made materials for each student.

9. It is possible to rearrange my room to accommodate individual and small group activities and special projects.

10. Transition of activities, e.g., going to lunch, restroom, playground, takes little time.

11. When individual students interrupt the learning process, I have the opportunity for individual counseling.

12. There is opportunity to work with each student on his/her individual math interest and achievement.

13. It is possible to respond immediately to student emergency, physical-intellectual and behavioral needs (i.e., blow nose, go to bathroom, answer questions).

14. There is opportunity for me to prescribe remedies for individual learning problems (i.e., cutting skills).

15. It is possible to cover adequately all of the required material.

16. There is time to individualize adequately material for small groups.

17. It is possible to keep disruptions to a minimum in my class.

18. There is sufficient time to use a broad range of teaching strategies with my students.

19. I have the opportunity to explore the interests, attitudes, and self-development needs of my students.

20. I have the opportunity to deal with student disruptions in an appropriate way.

21. My classroom problems could be greatly diminished if class size could be 1 to 15.

22. I have enough time to listen to the problems and concerns of all of my students.

23. Mastery of basic skills could be greatly increased with a class size of 15.

24. I have enough time to keep discipline problems from erupting in my classroom.

Figure 2. Item List of Inventory of Classroom Conditions

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Further Analyses of Project Effects

Table 1 (p. 7) shows that the X group outperformed the O and O_b groups in terms of achievement gain (CAT 10-11, pre-to-post) in both Math and Reading. This next set of analyses used as a base only those students that were matched on at least two test scores (pre/post on Math and/or pre/post on Reading) and had indicated Free Lunch or Not Free Lunch. This division resulted in the following numbers:

X	O	O_b	Total
80	56	80	216

Reading by Free Lunch or Not Free Lunch

Table 3 shows that for reading the pretest scores for the free lunch (FL) and not free lunch (NFL) groups were essentially the same in all three conditions. By the posttest two groups (O, O_b) are different, with the NFL group scoring higher than the FL group ($p \leq .05$). This finding would support the stereotype that higher SES youngsters perform better than their counterparts on achievement tests; both FL and NFL started first grade about even in reading, but the NFL group was performing better at the end of one year in the O and O_b conditions. Such is not the case in the X condition where the FL group began the year below the NFL group but by year end, both groups were statistically not different. The ANCOVA analysis (pre-to-post) shows that for O and O_b the NFL group outperformed the FL group ($p \leq .05$), but that in the X condition there were no statistically significant differences between FL and NFL.

Math by Free or Not Free Lunch

Table 4 shows that the FL and NFL (X) groups started out about the same and ended up (post) about the same. Both groups performed equally well. The FL and NFL groups in the O and O_b conditions, however, both followed the stereotypical pattern whereby the NFL group far surpassed the FL group. Note

TABLE 3

1:15 Project t Tests Between Free and Not Free Lunch Pupils on Reading Pre and Post Tests (1985) and ANCOVA (Pre to Post)

Reading		t-Tests									ANCOVA			
		Pre				Post								
Group	N n	$\bar{x}$	SD	t	Sig	N n	$\bar{x}$	SD	t	Sig	N n	$\bar{x}$	F	Sig
X	80					72					72	46.90		
1	34	100.88	17.43			29	46.31	8.08			29	46.31		
				-1.03	.31				-0.49	.62			0.27	.96
2	46	104.39	11.00			43	47.30	8.81			43	47.30		
O	64					78					63	39.17		
1	35	92.91	22.43			43	36.26	10.59			34	36.32		
				-0.36	.72				-1.92	.06			5.76	.019
2	29	94.97	22.89			35	41.17	11.71			29	42.52		
O_b	80					66					66	38.94		
1	34	100.88	17.57			27	35.11	9.37			27	35.11		
				-1.00	.32				-2.68	.01			6.95	.011
2	46	104.33	11.35			39	41.59	10.03			39	41.59		
TOT	224					216					201	41.87		
1	103	98.17	19.50			99	38.89	10.64			90	38.18		
				-1.66	.10				-3.24	.001			8.16	.005
2	121	102.11	15.23			117	43.56	10.47			111	44.05		

1=Free Lunch; 2=Not Free Lunch. CAT 10=120 items; CAT11=60 items. X=Exper.; O=Control; O_b=Blind Control.

TABLE 4

1:15 Project t Tests Between Free and Not Free Lunch Pupils on Math Pre and Post Tests (1985) and ANCOVA (Pre to Post).

Math Group	N / n	Pre $\bar{x}$	Pre SD	t-Tests t	Sig.	N / n	Post $\bar{x}$	Post SD	t	Sig	N / n	ANCOVA $\bar{x}$	ANCOVA F	Sig
X	79					72					71	47.06		
1	34	17.91	3.87			29	46.83	7.19			29	46.83		
				-0.18	.86				-0.12	.90			.11	.92
2	45	18.07	3.85			43	47.02	5.97			42	47.21		
O	63					77					62	42.23		
1	34	16.82	4.41			42	40.19	7.89			33	39.64		
				-0.72	.48				-2.22	.03			6.487	.013
2	29	18.03	8.12			35	44.46	8.80			29	45.17		
O_b	80					66					66	43.98		
1	34	19.35	4.92			27	42.04	8.07			27	42.04		
				-0.32	.75				-1.70	.095			4.73	.03
2	46	19.67	3.65			39	45.33	7.28			39	45.33		
TOT	222					215					199	44.53		
1	102	18.03	4.50			98	42.66	8.16			89	42.71		
				-1.00	.32				-2.83	.005			8.922	.003
2	120	18.68	5.17			117	45.69	7.36			110	46.01		

1=Free Lunch; 2=Not Free Lunch. CAT 10=26 items; CAT 11=56 items. X=Exper., O=Control, O_b=Blind Control

that at the posttest the NFL groups were ahead of the FL groups (0, 0_b) by meaningful margins ($p \leq .04$, .09); the ANCOVA shows that pre-to-post the NFL group outstripped the FL group (0, 0_b) significantly (.02, .03), but that the FL and NFL groups performed similarly in the X condition (p=.92).

Free Lunch or Not Free Lunch Summary

Inspection of Table 5 mean scores shows that the FL (X) group outperformed both 0 and 0_b NFL groups on both Reading and Math at the posttest, and that the FL (X) group, although ranked first (1) at posttest, was tied for first and ranked second at pretest. Results inferred from the ANOVA analyses and shown by the ANCOVA analyses suggest that pupils in the 1:15 condition outperformed pupils in the regular-size (1:25) classes, and that both higher and lower SES pupils performed equally well in the 1:15 classes. This is not true for regular classes where the NFL groups outperformed the FL groups (0, 0_b) on both Math and Reading.

Figures 3 and 4 portray these findings graphically. In figure 3 the differences in reading pretest x scores (FL vs. NFL) are shown for three conditions (X, 0, 0_b). The differences in posttest x scores (FL vs. NFL) are also shown for the three conditions. Note that pretest differences between FL and NFL favor the NFL (.) for all three groups but are not significant. At the posttest the differences are greater and favor the NFL (.) for 0 and 0_b and are considerable (.01, .09). At the posttest (X) the difference, although still favoring the NFL (.), has been reduced from 3.5 to 1.0 and is not significant.

In figure 4 the differences in math pretest x scores (FL vs. NFL) are shown for three conditions as are the differences in posttest x scores. Note that all pretest differences are slight and favor the NFL (.). No pretest differences (FL vs. NFL) are significant. At the posttest, the very small difference in the X group between FL and NFL favors the NFL (.) and is not

TABLE 5

ANOVA (Pre and Post) and ANCOVA (Pre to Post) Results for 3 Conditions (X, O, O_b)
For Free Lunch/Not Free Lunch: 1:15 Study, Reading and Math (1985)

Reading	ANOVA						ANCOVA		Math	ANOVA					ANCOVA	
	CAT 10 (Pre)*			CAT 11 Post*					CAT 10 (Pre)*			CAT 11 (Post)*				
Group (FL)	N	$\bar{x}$	Rk**	N	$\bar{x}$	Rk	N	$\bar{x}$	N	$\bar{x}$	Rk	N	$\bar{x}$	Rk	N	$\bar{x}$
(Tot)	103	98.2		99	38.9		90	39.2	102	18.0		98	42.7		89	42.7
1 (X)	34	100.9	1	29	46.3	1	29	46.3	34	17.9	2	29	46.8	1	29	46.8
2 (O)	35	92.9	3	43	36.3	2	34	36.3	34	16.8	3	42	40.2	3	33	39.6
3 (O_b)	34	100.9	1	27	35.1	3	27	35.1	34	19.4	1	27	42.0	2	27	42.0
F		1.97		12.41			12.87			2.80			6.43		8.40	
Sig		.145		.000			.000			.065			.002		.000	
Diff (.05) (Sheffe)***		No		1 vs. 2, 1 vs. 3			N/A			No			1 vs. 2		N/A	
(NFL)																
(Tot)	121	102.1		117	43.6		111	40.1	120	18.7		117	45.7		110	46.0
1 (X)	46	104.4	1	43	47.3	1	43	47.3	45	18.1	3	43	47.0	1	42	47.2
2 (O)	29	95.0	3	35	41.2	3	29	42.5	29	18.0	2	35	44.5	3	29	45.2
3 (O_b)	46	104.3	2	39	41.6	2	39	41.6	46	19.7	1	39	45.3	2	39	45.3
F		4.43		4.62			4.30			1.41			1.25		1.57	
Sig		.014		.012			.016			.250			.291		.213	
Diff (.05) (Sheffe)		1 vs. 2, 2 vs. 3		1 vs. 2, 1 vs. 3			N/A			No			No		N/A	

*Reading: CAT 10=120 items; CAT 11=60 items; Math: CAT 10=26 items, CAT 11=56 items
**Rk=Rank. ***Difference between groups as identified by Sheffe test.

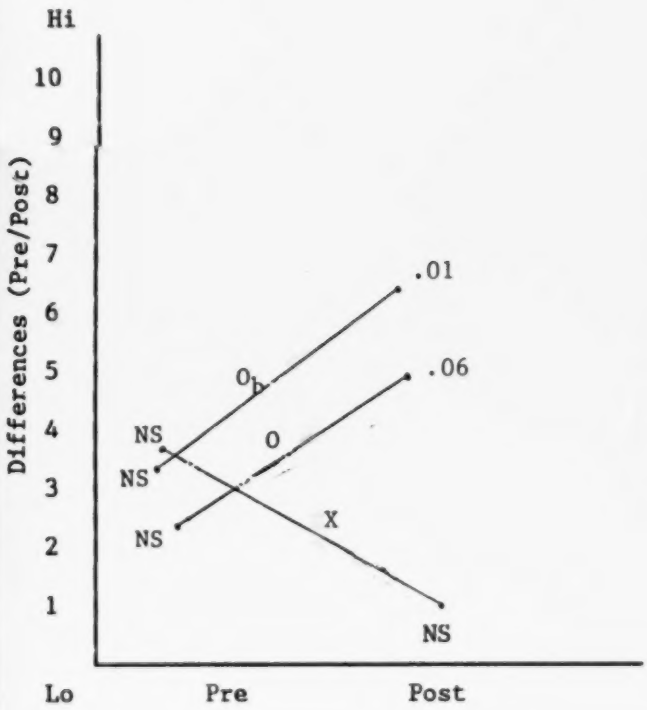

Figure 3. Plot of differences in mean scores, FL and NFL, Pre to Post in Reading for 3 conditions.

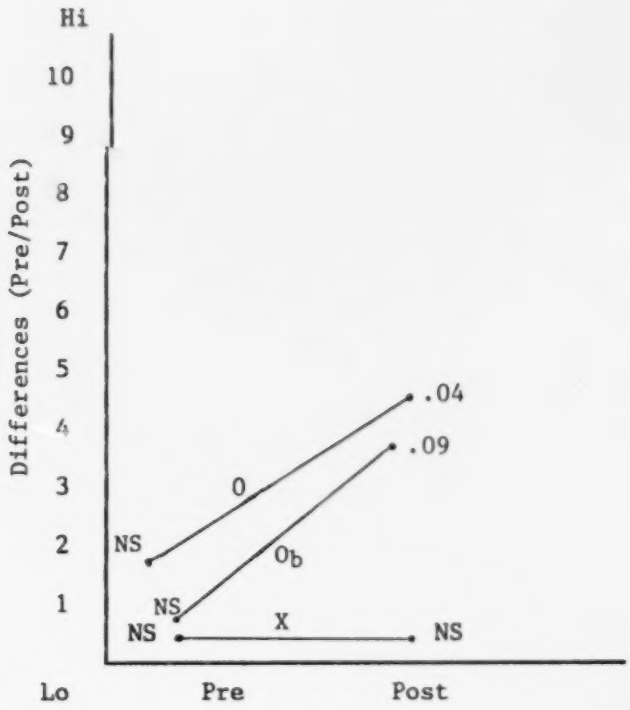

Figure 4. Plot of differences in mean scores, FL and NFL, pre-to-post in Math for 3 conditions.

. difference favors NFL. Data from Tables 3, 4, 5.
X = 1:15, O = Control, O_b = Blind Control

	Pre	Post	(X2.9?)* ← Differences → (All Favor NFL)		Pre	Post	(÷2.15?)*
X	3.5	1.0	2.0	X	.2	.2	.09
O	2.1	4.9	4.9	O	1.5	4.5	2.00
O_b	3.4	6.5	6.5	O_b	.3	3.3	1.53

Note: The Pre/Post differences may need to be adjusted. Note that CAT 11 Reading contains .50 the number of CAT 10 Reading items (Multiply Post differences by 2?) CAT 11 Math contains 2.15 the number of CAT 10 Math items (Divide post differences by 2.15?). Relationships would remain.

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significant. For the O and O_b conditions, however, the large differences (.04, .09) favor the NFL (.).

Results of these analyses suggest that, for whatever reason, lower SES youngsters (those on free lunch) in the X group perform about the same as their higher SES counterparts (pupils not on free lunch), and that the total 1:15 group (FL plus NFL) outperforms similar pupils in regular (1:25) classes. Additional analyses should add more information about this interesting finding. (Some possibilities will be analyses over time by race, by sex; studies of teacher behaviors; studies of pupil-teacher interactions).

The study entered its second year in the fall, 1985 with another group of teachers for the second grade. One concern is the loss of students from the three groups as they progress through the third grade. Effort will be made to track study participants through subsequent years.

Initial-year results favor the 1:15 classes in pupil achievement, behavior, teacher perceptions and in teacher comments regarding instruction and classroom activity. The 1:15 condition seemed to benefit free lunch and not free lunch pupils approximately the same, rather than contributing to the usual, or stereotypical result, whereby NFL youngsters outperform their lower-SES counterparts.

A major task will be to try to identify just what it is that is occuring in the 1:15 condition that seems to lead to improved pupil outcomes. It seems less likely that the 1:15 condition by itself directly influences pupil gains than that the 1:15 condition encourages or allows improved teaching/learning. One challenge, it seems, is to try to identify the major variables that are activated by significantly reduced class size (e.g., 1:15) and that directly influence pupil outcomes.

Bibliography

Balow, I. H. (1969). "A Longitudinal Evaluation of Reading Achievement in Small Classes". Elementary English. February, pp. 186-187.

Education Research Service. (1978). Class Size: A Summary of Research. Arlington, VA: ERS, Inc.

Education Research Service (1980). Class Size Research: A Critique of Recent Meta-Analysis, Arlington, VA: ERS, Inc.

Glass, Gene V., L. S. Cahen, M. L. Smith, N. Filby. (1979). "Class Size and Learning: A New Interpretation of the Research Literature." Today's Education. April/May.

Glass, Gene V., et. al. (1982). School Class Size: Research and Policy. Beverly Hills, CA: SAGE Publications.

Whittington, E. H. (1985). "Effects of Small Class Size (1:15) on the Teaching/Learning Process in Grade One." Unpublished Doctoral Dissertation. Tennessee State University, Nashville, Tennessee, August.

_____, H. P. Bain, C. M. Achilles (1985). "Effects of Class Size on First-Grade Students." ERS Spectrum. 3, 4(Fall) pp. 33-39.